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HOT MILLING OF ROCK-DRILL BITS AT THE MINES OF THE VINEGAR HILL ZINC CO., PLATTEVILLE, WIS.

BY

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HOT MILLING OF ROCK-DRILL BITS AT THE MINES OF THE VINEGAR HILL ZINC CO., PLATTEVILLE, WIS.[1]

By Wing G. Agnew[2]

The drilling and bit-sharpening practice in the southwest Wisconsin zinc district generally conforms to the procedure described herein, except at very small properties, where drill steel is sharpened by hand.

Though hot milling of rock-drill bits is practiced in South Africa on some of the large-scale operations, it is seldom seen at American mines in any form. Because of the simplicity and low cost of the equipment, it was thought that a brief description might prove interesting to some of the operators in other districts who do not have enough steel to sharpen to warrant equipping an elaborate sharpening shop.

The drill-steel problem at the mines of the Vinegar Hill Zinc Co. is not of major importance. Most of the drilling is done in limestone, and consequently the bits have a comparatively long life, although when chert or quantities of iron sulphide are encountered considerable gage is lost. Sometimes when the ground is extremely soft, a miner can drill two shifts with one set of steel. Drilling is done with hand-held machines of 2-1/4- and 2-1/2-inch bore, using 7/8-inch hollow-collared hexagon drill steel. Starters are 2 to 3 feet long, with a 1-13/16-inch gage, and finishers are 16 feet long, with a 1-3/8-inch gage. The gage change is 1/16-inch per 2-foot run. Bits are of the six-point type with water hole in the center. The average holes are drilled only 10 to 13 feet in depth. Depending on the working place, 6 to 10 holes are considered a shift's work.

The bits are heated in an ordinary blacksmith's coal forge and formed on a small sharpener. Then, in the same heat they are hot-milled, unless they have become too cold and have to be reheated. If milled too cold, the wear on the cutting wheel will be rapid. The cutting wheel used in this operation is 6 inches in diameter and 3/4 inch thick, and has a beveled face. The teeth are 1/4 inch, point to point, and extend on the bevels to cut a V-shaped groove. The angle between the beveled faces is 90° but may be varied, depending upon the groove desired. The cutter is mounted, in place of one of the emery wheels, on a standard pedestal grinder and turns at about 2,000 revolutions per minute. To act as a guide, an ordinary piece of 4-inch angle iron, in which a slot has been cut, is bolted to the 10-inch post on which the grinder is mounted. The slot is 2 inches wide at the top, 1 inch at the bottom, and 3-1/2 inches deep. The bottom of the rest is 5-1/2 inches below the center line of the wheel and 4 inches in front of it. A 3-inch angle iron has been bolted to the 4-inch angle iron to form a channel for the cuttings and a front guard. As shown in the figure, the wheel is equipped with a very good safety guard. The channel is 2 feet long and tilts back 1 inch in 6 from the vertical to carry the cuttings farther from the operator's feet.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U.S. Bureau of Mines Information Circular 6907."

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The hot drill steel is rested in the guide slot, and the cutting wheel is used to deepen the grooves between the cutting edges of the bit. In so doing, these edges are depressed about 1/8 inch at the center hole. The clearance grooves between the wings are also cut deeper in the same operation. At one mine the steel was upset with a blank dolly, after which the wings and faces were cut with the wheel. Sometimes at a mine with no sharpener the steel is upset with hand tools and finished by hot milling. At another mine an old piston drill was used to upset the bit.

It is claimed that this bit, with the cutting edges depressed at the center hole and with the deeper clearance grooves, is freer cutting and has less tendency to rifle or stick in fitchery ground than the ordinary pattern with normal cutting edges.

Dies and dollies are made to form the same bit, but the equipment costs much more and for the small amount of steel sharpened per day this method is satisfactory. Although originally this method was adopted to reduce the capital expense for equipment, yet after its introduction it was found that the quality of the bits was improved and the method was much faster than sharpening by hand tools.

Cutting wheels are made by the blacksmith after the blank has been turned down in the machine shop. Some have been made of old steel crusher shafting that gave fair service, but the best cutters have been made from a special modified high-speed steel hardened by heating to 2,000°-2,150° and quenching in a light, warm oil. The teeth of the cutter are marked on the blank by notching with a hacksaw 3/16 inch deep. The teeth are then filed with a regular 7-inch saw file. It takes six to eight files and about 2 days to make a cutter wheel. To sharpen one after it has been annealed it is filed in the same way. They are used until they are down to about a 4-inch diameter before being discarded. The average life of a good cutter wheel is about 1 year.

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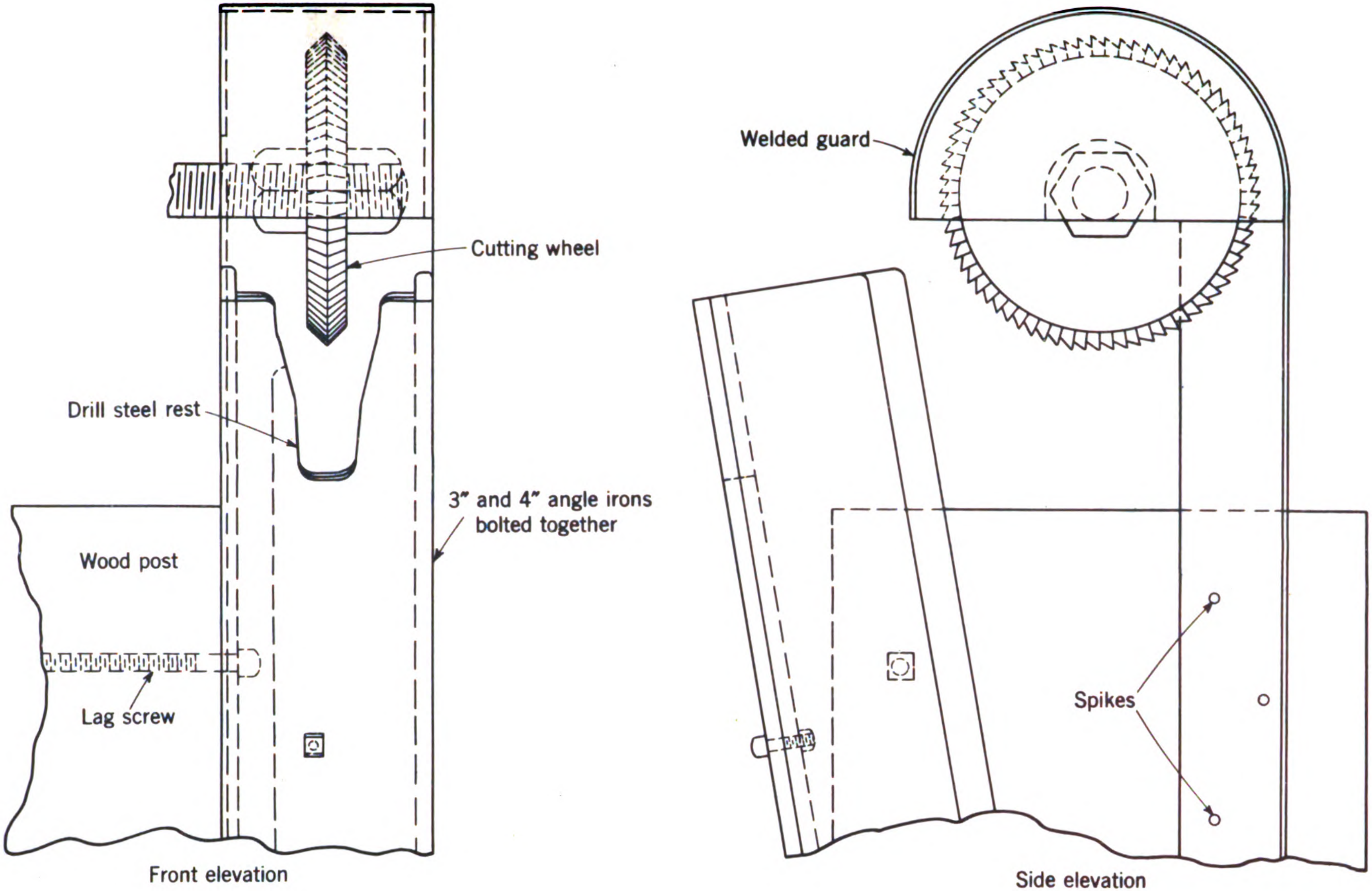

Figure 1.—Hot miller for rock-drill bits.

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